Critical System Event Prediction in Virtualized Cloud Computing Systems

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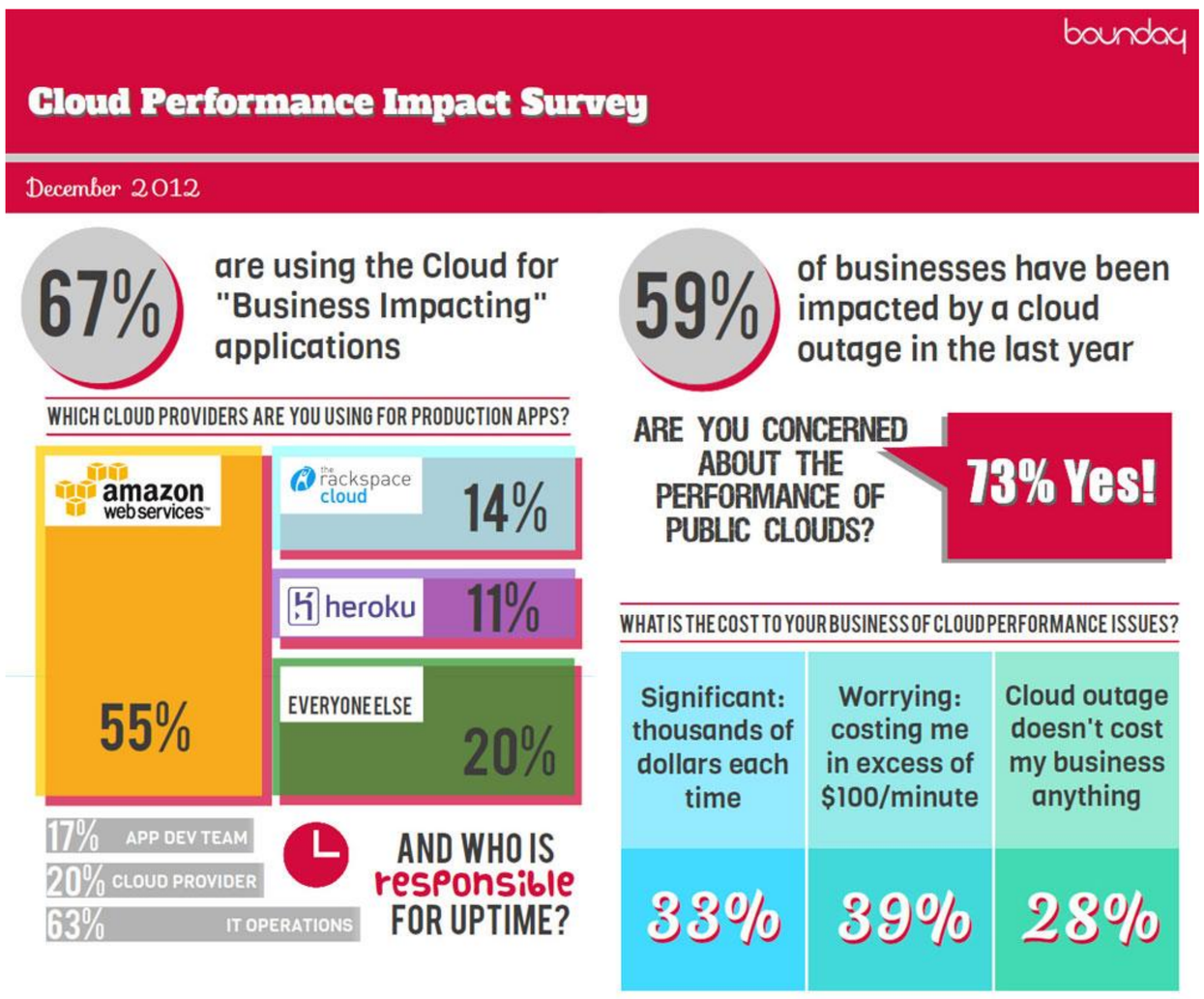
Introduction

Cloud computing is an infrastructure that provides efficient and flexible computing platforms for service providers and service consumers. The cloud is constructed on varies computer systems over communication networks. It provides computing resources to multiple services through a unified computing platform. In cloud computing environment, virtualization techniques are used to increase the utilization of physical hardware and network connections. In the on-demand cloud environment, web application providers have the potential to scale virtual resources up or down to achieve cost-effective outcomes. The virtualization technique makes users cannot tell the difference between virtualized computer system hardware and real computer system hardware. And users expect the same capability as the real physical machine. Therefore, virtualized systems receive all type of requests and commands. These requests and commands are finally passed to the host operating system or hypervisor to allocate system resources and do the computation.

The system reliability is one of the most important requirements for cloud computing platform providers. The reliability is the proper functioning of the system under the full range of conditions experienced in the field. However, cloud providers are facing reliability issues on there cloud platform, such as power outages, software errors, noisy neighbor problems. In order to increase reliability of cloud platform, especially in virtulized computing environment, we presents a critical event prediction framework for virtualized cloud systems.

Key Features & Issues

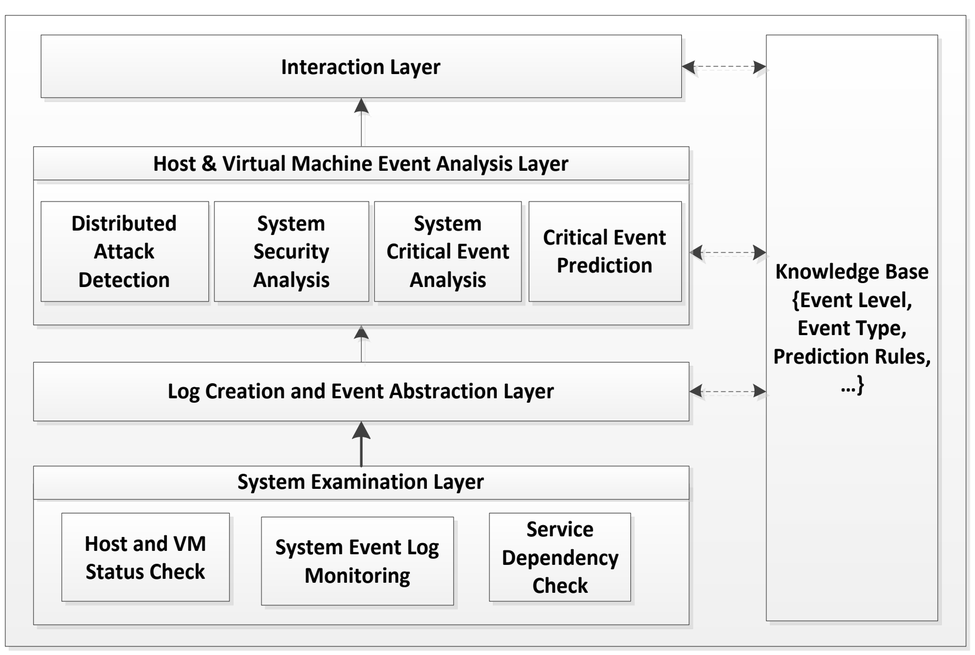


[1]

Vendor	When	Duration	What happened & Why
Twitter	June 21, 2012	2 Hours	Service crashed around 9. AM Pacific time, came back online briefly around 10:10 AM Pacific time but failed half-hour later. The site recovered by 11:08 a.m. Pacific Time. Outage affected all platform and took down both third party and twitter apps on then Andriod & iOS platforms.
Apple iCloud	June 20, 2012	4 Hours	Some users of Apple's iCloud and iMessage services reported outages and users were unable to send or receive messages on iOS or user the various iCloud features. Even Apple employees in its Cupertino headquarters too complained about the internet connection issues.
Amazon Web Services	Otc 22, 2012	2 Hours	Amazon's data center in northern Virginia was down because of power outage [2]. This incident is caused by a weather condition. There is another service outage happened in October, which is caused by a hardware failure. The failure event happened in a single server, and was propagated to the entire system through a chain of software and hardware events. If there is a mechanism, which could monitor servers to prevent this kind of situation, the service providers can provide more reliable services.

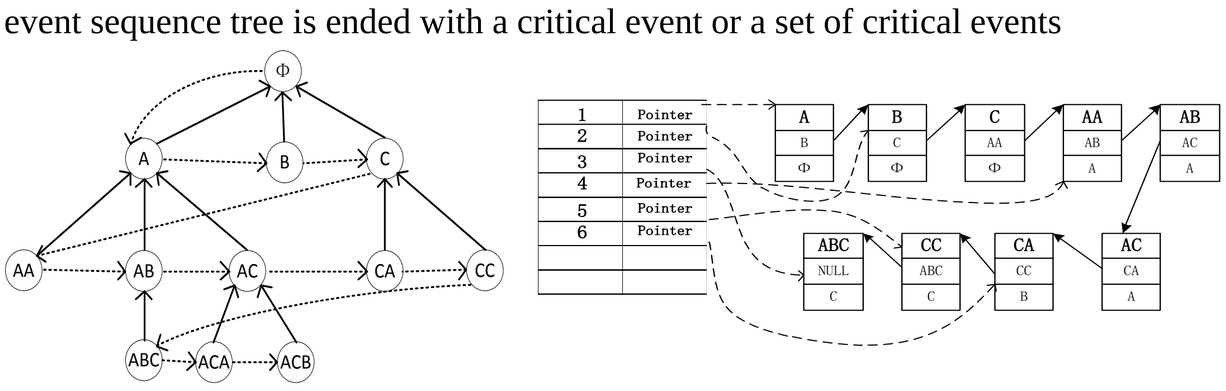
Non-intrusive Log Processing Framework

In order to find these critical events, we propose a non-intrusive log processing framework that analyzes system event logs from both virtual machine and host machines. This Figure shows the architecture of the proposed framework.



Hash Table with Reversed Frequent Pattern Tree

In multi-tenant environment, critical events happened in virtual machines affect not only virtual machines but also host machine. In order to reduce adverse effects from critical events, critical event prediction is incorporated in proposed framework. The critical event prediction utilizes the statistical information of frequent patterns to predict known critical events. This step is processed at the same time of the recognition. Because every event pattern is ended with a critical event, the event sequence tree is a monitor of the system event sequences. The event sequence tree is a compressed tree, which does not contain all nodes, and its leaves are ended with critical events. Therefore, during the recognition, new added the event sequences are all ended with a critical event. As a result all leaves in the event sequence tree is ended with a critical event or a set of critical events



Conclusion

we proposed a real-time critical event pattern recognition and prediction framework to predict critical events in virtualized cloud computing environment. This framework combines features of hash table and reversal pattern tree structure to increase the recognition and prediction speed for real time critical event pattern recognition and prediction.